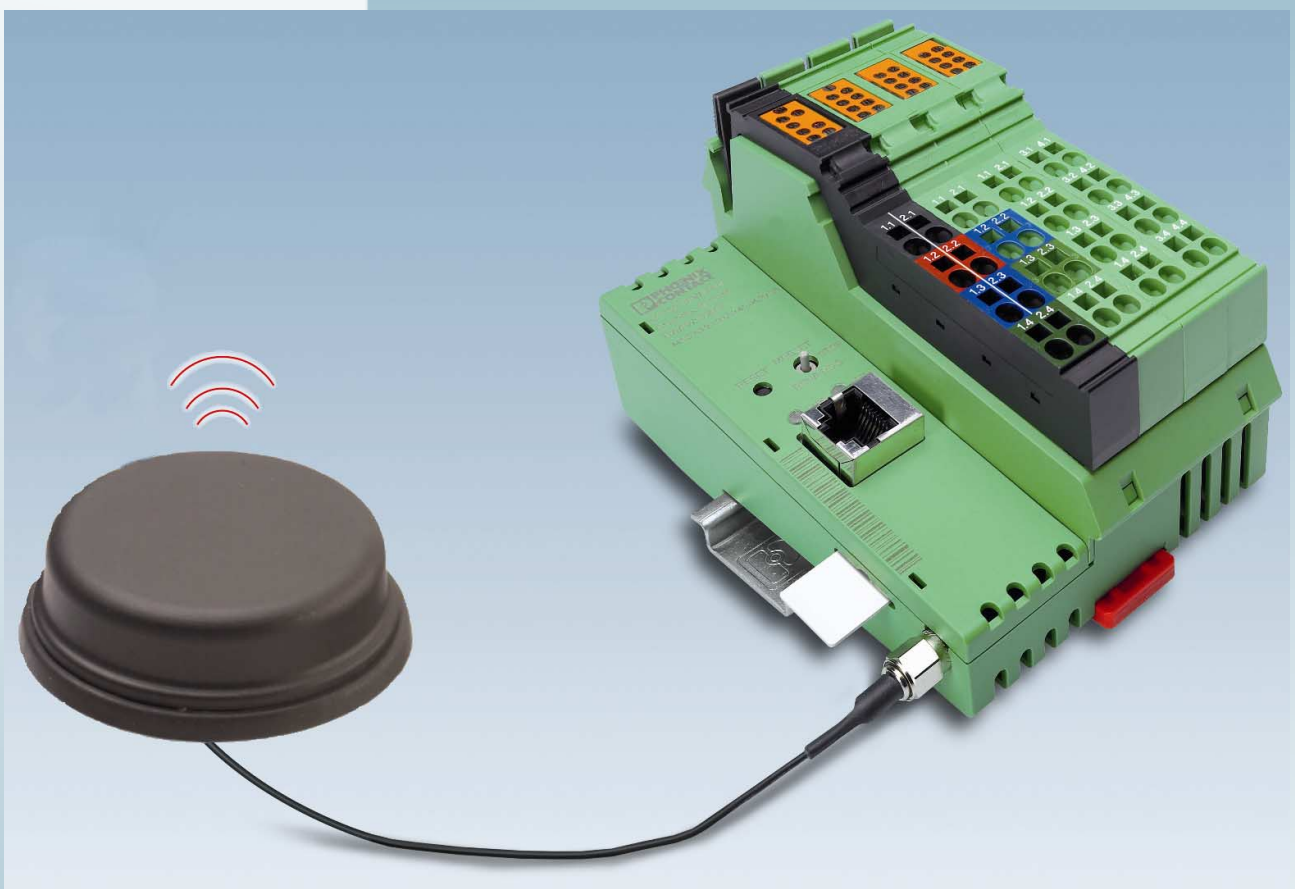
AUTOMATION



User Manual

UM EN ILC 150 GSM/GPRS

Order No.: —

Installing and operating the Inline Controller
ILC 150 GSM/GPRS

PHOENIX CONTACT
INSPIRING INNOVATIONS

AUTOMATION

User Manual

Installing and operating the Inline Controller ILC 150 GSM/GPRS

05/2008

Designation: UM EN ILC 150 GSM/GPRS

Revision: 00

Order No.: —

This user manual is valid for:

Designation	From Revision (HW)	From Revision (FW)	Order No.
ILC 150 GSM/GPRS	02	2.10	2916545

Please observe the following notes

In order to ensure the safe use of the product described, you have to read and understand this manual. The following notes provide information on how to use this manual.

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This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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1 Preface

1.1 Purpose of this manual

This manual helps you to start up and operate the ILC 150 GSM/GPRS Inline Controller.

1.2 Hardware and software requirements

– Inline Controller
– PC WorX automation software in the following versions:

ILC 150 GSM/GPRS

PC WorX Version 5.20 or later
(part of the AUTOMATIONWORX Software Suite 2008 1.40)

PC WorX Express Version 5.20 or later
(part of the AUTOMATIONWORX Software Suite 2008 1.40)

For the ordering data for hardware, software, and additional documentation, please refer to "Technical data and ordering data" on page 5-1.

2 Description of the Inline Controller

2.1 General description of the Inline Controller

The Inline Controller is a compact controller with integrated Ethernet and INTERBUS connections. In addition, the ILC 150 GSM/GPRS has a GSM/GPRS modem.

IEC 61131 control performance

The Inline Controller is seamlessly configured and programmed according to IEC 61131 using the PC WorX automation software. PC WorX can be operated via the network (Ethernet). The powerful processor can be programmed in all five IEC 61131 programming languages and ensures quick control task processing.

Integrated Ethernet connection

The integrated Ethernet connection (using twisted pair cable) provides for the Ethernet connectivity. Throughout the Ethernet network, the Inline Controller can be accessed via Ethernet and TCP/IP or UDP/IP.

Integrated communication functions enable direct and effective data exchange via Ethernet. The Ethernet network provides universal options for communicating with the Inline Controller. Using the send and receive communication blocks, information, e.g., necessary coupling variables, can be exchanged between Inline Controllers via Ethernet. This enables distributed, modular automation solutions to be configured.

The existing IEC 61131-5 blocks have thus been extended to include a TCP/IP mode and a UDP/IP mode.

When using the AX OPC server (Version 2.30) provided in the AUTOMATIONWORX Software Suite Version 1.40 or later, Inline Controller data is available in the Ethernet network in a standardized format and can be used for the different visualization packages.

Integrated INTERBUS connection

The I/O level is connected to the Inline Controller using INTERBUS.
The Inline Controller can also be used as the head of an INTERBUS Inline station. It is possible to connect an Inline local bus as well as a remote bus. In this way you can create a complete INTERBUS system (maximum of 4 remote bus levels) using the Inline Controller as the distributed control system.

2.2 Possible fields of application of the ILC 150 GSM/GPRS

The **ILC 150 GSM/GPRS** Inline Controller can be used as a distributed control system of an Inline station, which is connected to an Ethernet system. A single Inline local bus (Figure 2-1) as well as a complete INTERBUS system with a maximum of 4 remote bus levels (Figure 2-2) can be connected to the Inline Controller.

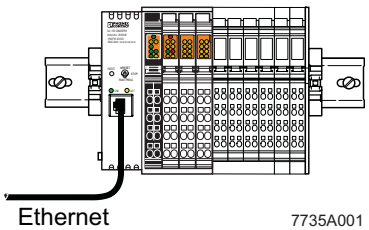


Figure 2-1 Connected Inline local bus

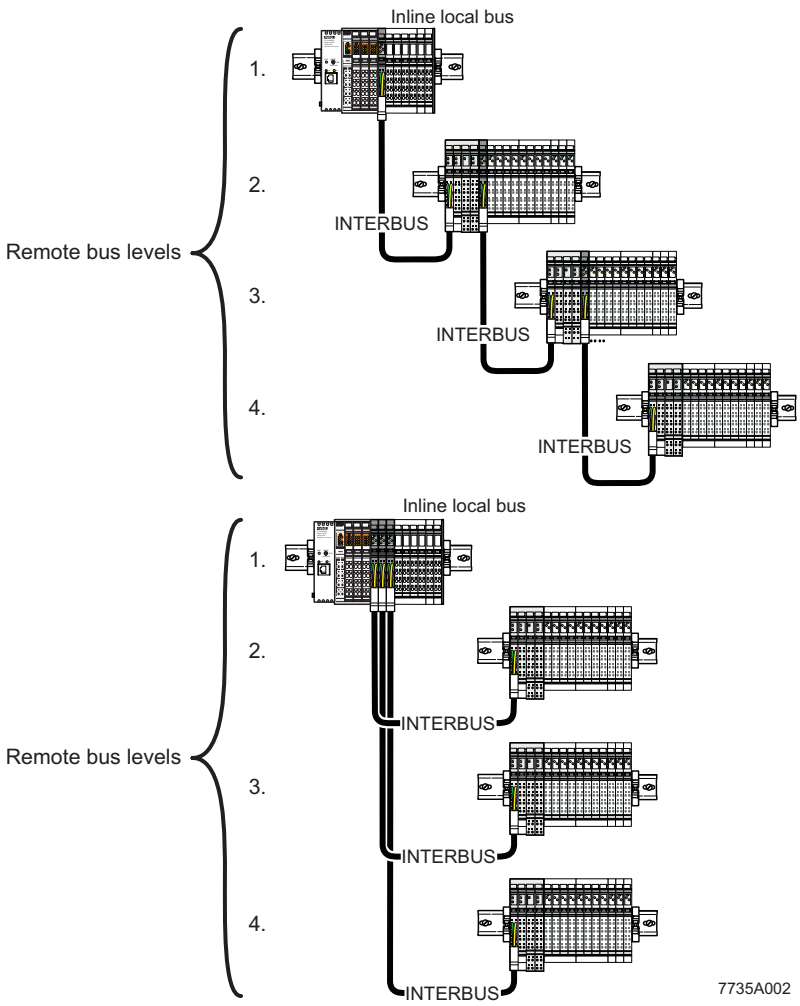


Figure 2-2 Remote bus levels

2.3 Unpacking the Inline Controller

The Inline Controller is supplied in an ESD bag together with a package slip with installation instructions. Please read the complete package slip carefully before unpacking the Inline Controller.

NOTE: Electrostatic discharge

The Inline Controller contains components that can be damaged or destroyed by electrostatic discharge. When handling the Inline Controller, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1 and EN 61340-5-2.

NOTE:

To avoid possible damage to the Inline Controller, unpack and pack the controller in accordance with the ESD regulations.

2.4 Connection and operating elements

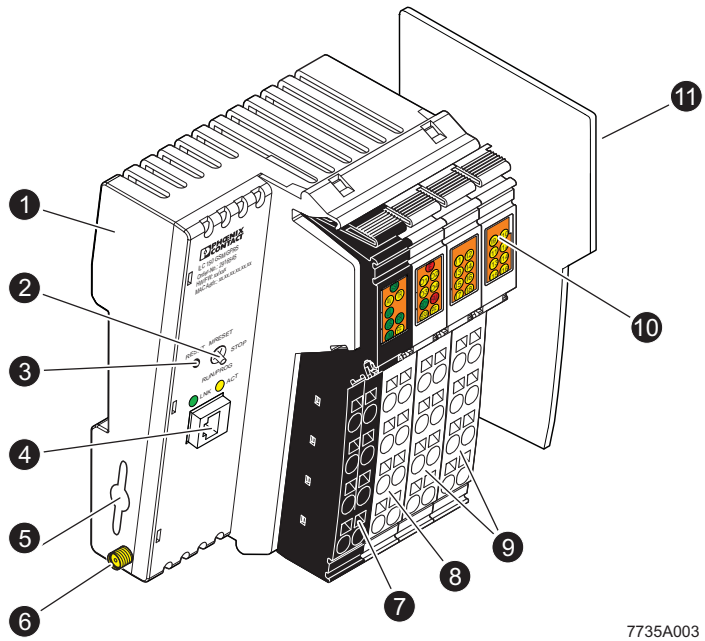


Figure 2-3 Structure of the Inline Controller

The Inline Controller consists of the following components:

1 Electronics base
2 Mode selector switch
3 Reset button
4 Ethernet connection
5 Slot for SIM card (the card is not supplied as standard)
6 SMA antenna connection (the antenna is not supplied as standard)
7 Connector 1: Terminal points for voltage supply
8 Connector 2: Output terminal points
9 Connectors 3 and 4: Input terminal points
10 Diagnostic and status indicators
11 End plate (as station end)

2.5 Diagnostic and status indicators

The diagnostic and status indicators are used for quick local error diagnostics.

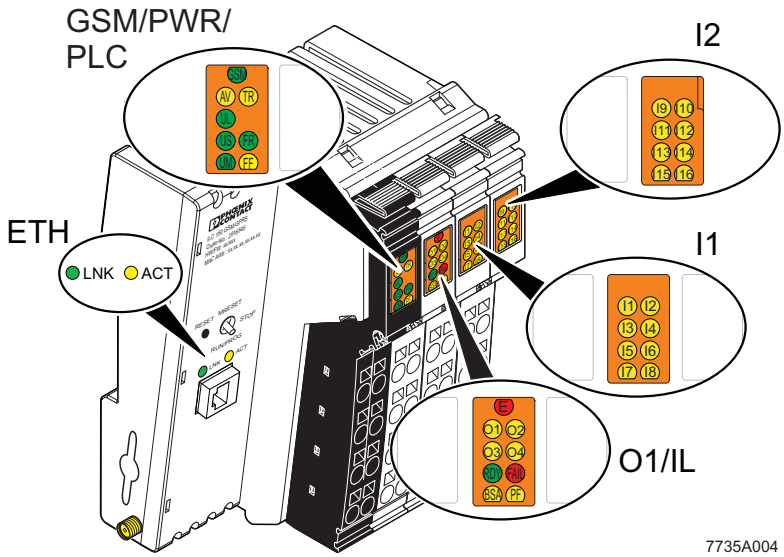


Figure 2-4 Diagnostic and status indicators

Local diagnostic and status indicators

Des.	Color	Meaning
ETH: State of the Ethernet interface		
LNK	Green	Connection established successfully (link).
	ON:	The Inline Controller is able to contact another network device.
ACT	Yellow	Data transmission (activity).
	ON:	Ethernet interface transmitting or receiving data.
PLC: Diagnostics of the Inline Controller		
FR	Green	Inline Controller running.
	OFF:	IEC 61131 runtime system not ready to operate.
	Flashing:	IEC 61131 runtime system successfully initialized. Control function in READY/STOP state, program not processed.
	ON:	IEC 61131 runtime system successfully initialized and program running. Control function in RUN state.
FF	Yellow	Failure
	ON:	A runtime error has occurred in the IEC 61131 runtime system program.
	OFF:	No runtime error has occurred in the IEC 61131 runtime system program.

Des.	Color	Meaning
GSM: Diagnostics of the GSM connection		
GSM	Green	GSM status
	OFF:	GSM module not switched on.
	Flashing:	GSM module logged into the GSM network.
	Flashing quickly:	Searching for network. GSM module not logged into the GSM network.
	ON:	Transmission active.
AV	Yellow	Device is dialed into the GSM network (available).
TR	Yellow	GSM/GPRS data transmission active (traffic).
PWR: Supply voltage (see also "Remote bus" on page 2-18).		
UL	Green	24 V supply U_{ILC} for generating the voltages U_L and U_{ANA}
	ON:	Supply voltage present (indication if 24 V supply voltage U_{ILC} present).
US	Green	24 V supply for segment circuit
	ON:	Supply voltage present.
UM	Green	24 V supply for main circuit
	ON:	Supply voltage present.
IL: Diagnostics for INTERBUS		
RDY	Green	INTERBUS master ready to operate/data transmission active (INTERBUS ready/running).
	Flashing:	INTERBUS master in READY or ACTIVE state.
	ON:	INTERBUS master in RUN state.
FAIL	Red	Failure
	ON:	One of the following errors occurred: - Bus error in the connected bus (remote bus/local bus) - Controller error.
BSA	Yellow	Bus segment aborted.
	ON:	One or more bus segments in the connected bus are switched off.
PF	Yellow	Peripheral fault
	ON:	Peripheral fault of a device in the connected bus (local bus or remote bus).
I/O: Digital inputs and outputs		
I1 to I16	Yellow	Inputs 1 to 16
	ON:	Corresponding input is set.
E	Yellow	Error
	ON:	Short circuit/overload at outputs 1 to 4.
O1 to O4	Yellow	Outputs 1 to 4
	ON:	Corresponding output is set.

2.6 Mode selector switch

The mode selector switch is used to define the operating state of the application program.

The RUN/PROG and STOP positions have a toggle button function and the MRESET position a pushbutton function. After releasing the button in the MRESET position, it returns to the STOP position.

Table 2-1 Inline Controller operating modes

Operating mode	Explanation
RUN/PROG	The application program is in the RUN state. The PC WorX software can be used for program and configuration modifications. The monitoring and online functions can be used.
STOP	The application program is in the STOP state.
MRESET	Retain data and the application program are deleted. For safety reasons, set the mode selector switch in the following sequence to perform deletion: • Set the switch to the MRESET position for three seconds. • Release the switch for three seconds. • Set the switch to the MRESET position for three seconds.

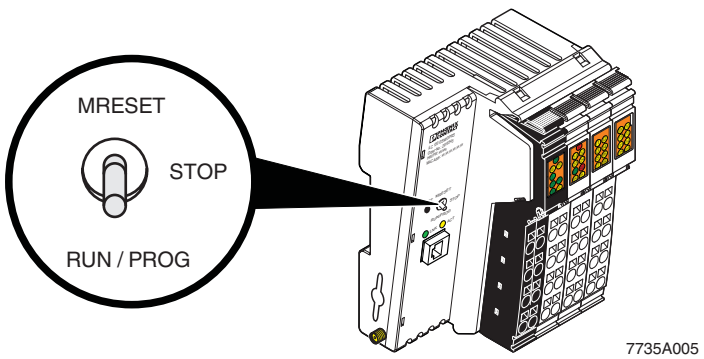


Figure 2-5 Mode selector switch

2.7 Reset button (concealed)

The reset button (see 3 in Figure 2-3 on page 2-4) on the Inline Controller can only be operated with a pin and is therefore protected against accidental activation.

Pressing the reset button causes a complete reset of the Inline Controller.

If you carry out a voltage reset at the same time as you press the reset button, this resets the Inline Controller to its default settings.

2.8 Parameterization memory

The Inline Controller has an integrated parameterization memory.

For additional information about the parameterization memory, please refer to "Parameterization memory and Internet Explorer" on page 3-7.

2.9 Internal basic circuit diagram

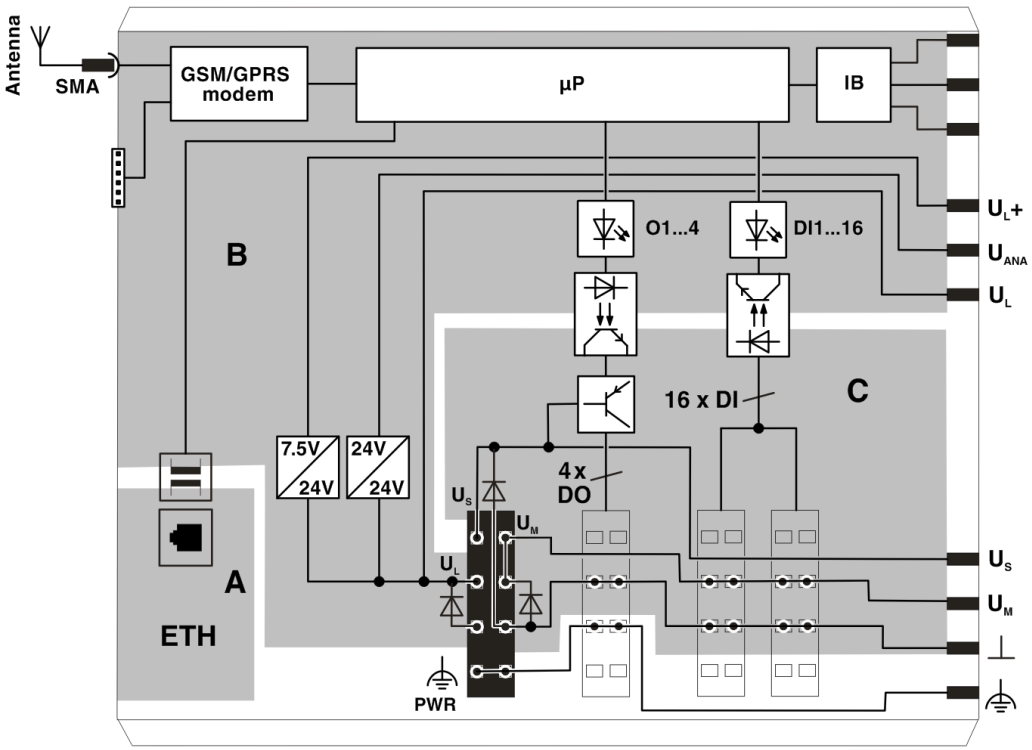


Figure 2-6 Internal basic circuit diagram

Key:

µP	Microprocessor		Converter
IB	Protocol chip		LED
SMA GSM/GPRS modem	GSM/GPRS modem and antenna with SMA connection		Optocoupler
	Transmitter		NPN transistor
	RJ45 female connector		SIM card (the SIM card is not supplied as standard)

The gray areas in the basic circuit diagram represent the electrically isolated areas:

A: Ethernet interface
B: Logic
C: I/O

Other symbols used are explained in the IL SYS INST UM E user manual.

2.10 Mounting and removing the Inline Controller

For notes and instructions on mounting and removing Inline terminals, please refer to the IB IL SYS PRO UM E user manual (for INTERBUS), the IL SYS INST UM E Inline installation manual or the Inline system manual for your bus system.

NOTE:
Before mounting or removing the Inline Controller, ensure that the power supply is switched off and cannot be switched on again by unauthorized persons.

An Inline station is set up by mounting the individual components side by side. No tools are required. Mounting the components side by side automatically creates potential and bus signal connections between the individual station components.

The modules are mounted perpendicular to the DIN rail.

Mounting location

As all other terminals of the Inline product range, the Inline Controller has IP20 protection and is designed for use in a closed control cabinet or control box (terminal box) with IP54 protection or higher.

DIN rail

The Inline Controller is mounted on a 35 mm standard DIN rail.

Fix the DIN rail on which the Inline Controller is mounted several times, especially in the area around the Inline Controller. This makes it easier to remove the Inline Controller.

End clamps

Mount end clamps on both sides of the Inline station. The end clamps ensure that the Inline station is correctly mounted. End clamps secure the Inline station on both sides and keep it from moving from side to side on the DIN rail. Phoenix Contact recommends using CLIPFIX 35-5 end clamps (Order No. 3022276).

End plate

The mechanical end of an Inline station is the end plate. It has no electrical function. It protects the station from ESD pulses and the user from dangerous contact voltages. The end plate is supplied together with the Inline Controller and does not need to be ordered separately.

NOTE:
When mounting or removing the Inline Controller it must be tilted. This means that no Inline terminal should be installed directly to the right of the Inline Controller during mounting and removal. The terminal must be removed prior to mounting or removing the Inline Controller. Otherwise, the locking clips and jumper contacts will be damaged.

Mounting position

Mount the Inline Controller horizontally (as shown in Figure 2-7). The specified temperature range (see "Ambient conditions" on page 5-5) is only guaranteed if the Inline Controller is mounted in this position.

Mounting

When mounting the Inline Controller, proceed as shown in Figure 2-7:

- Disconnect the power to the station.
- Place the Inline Controller onto the DIN rail from above (detail A) and push down (detail B).
- Then attach all the electronics bases required to set up the station. Observe the information provided in the above user manuals.

Ensure that **all** featherkeys and keyways on adjacent terminals are securely interlocked.

- Once all the bases have been snapped on, plug the connectors into the appropriate bases.
  First, place the front connector shaft latching in the front snap-on mechanism (detail C1).
  Then press the top of the connector towards the base until it snaps into the back snap-on mechanism (C2).

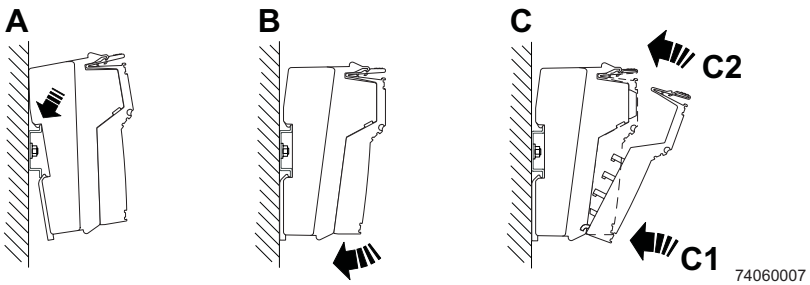


Figure 2-7 Snapping on the Inline Controller

Removal

When removing the Inline Controller, proceed as shown in Figure 2-9:

- Disconnect the power to the station.

Unlike other Inline terminals, the Inline Controller is removed by tilting it away from the DIN rail. This requires the Inline terminal to the right to be removed prior to removing the Inline Controller. The right connector of the Inline Controller must also be removed.

Remove the third and fourth connectors to access the right base latch.

It is therefore recommended that all connectors be removed prior to removing the Inline Controller.

- If you damage the connectors during removal:
  Remove all the connectors of the Inline Controller.
  - Lever up each connector by pressing on the back connector shaft latching (Figure 2-9, detail A1).
  - Remove the connectors (Figure 2-9, detail A2).
- If Inline terminals are installed next to the Inline Controller (see Figure 2-8):
  - Remove the following connectors:
    – All connectors of the terminal directly connected (A1 to A4).
    – The adjacent connector of the following terminal (B1).
  - Remove the directly adjacent Inline terminal (A).

Observe the information provided in the above user manuals.

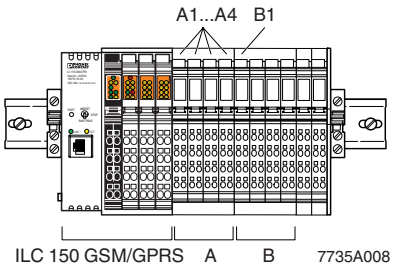


Figure 2-8 Connectors to be removed if terminals are installed next to the Inline Controller

- Insert a tool in the base latches of the Inline Controller and pull gently upwards (Figure 2-9, detail B). Pull out the Inline Controller from the DIN rail (detail C1, C2).

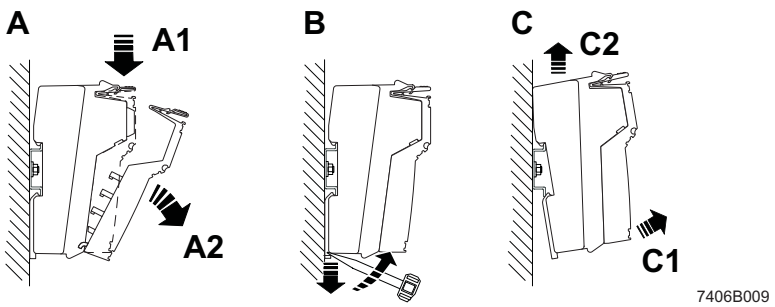


Figure 2-9 Removing the Inline Controller

Replacing the Inline Controller

If you want to replace an Inline Controller within an Inline station, proceed as described above (removing and mounting). Make sure that the terminal to the right is not installed when removing and mounting the Inline Controller. Only reinstall this terminal once the Inline Controller is mounted.

In particular, make sure that **all** featherkeys and keyways on adjacent terminals are securely interlocked.

Observe the following when replacing an Inline Controller:
Enter the new MAC address when using the BootP server.

2.11 Communication path

For communication with the Inline Controller, the following communication path is available:

(A) Ethernet 10/100Base-T(X)

A standardized Ethernet interface is available for connecting the Ethernet network. The Ethernet network is connected via an RJ45 female connector.

Use an Ethernet cable according to Cat. 5 of IEEE 802.3.

Planning and installation of your Ethernet network must be carried out according to the IAONA "Industrial Ethernet Planning and Installation Guide" (see www.iaona-eu.com).

The contact assignment of the interface is as follows:

Transmit data +	T +	1
Transmit data -	T -	2
Receive data +	R +	3
-		4
-		5
Receive data -	R -	6
-		7
-		8

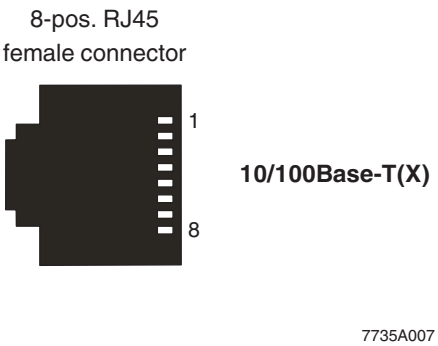


Figure 2-10 Ethernet interface

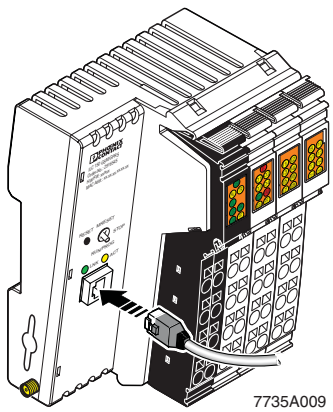


Figure 2-11 Connecting the Ethernet cable to the Inline Controller

The interface is able to switch-over the transmitter and receiver automatically (auto crossover).

2.12 SIM card

NOTE:
Disconnect power to the Inline Controller before changing the SIM card.
The controller only supports 3 V SIM cards. In the event of older SIM cards, please contact your GSM service provider.

You will receive a SIM card from your GSM service provider, which will be used to store all the important data for your connection.

- If the SIM card has been supplied in credit card format, simply detach the small section of the card and remove protruding parts of plastic.

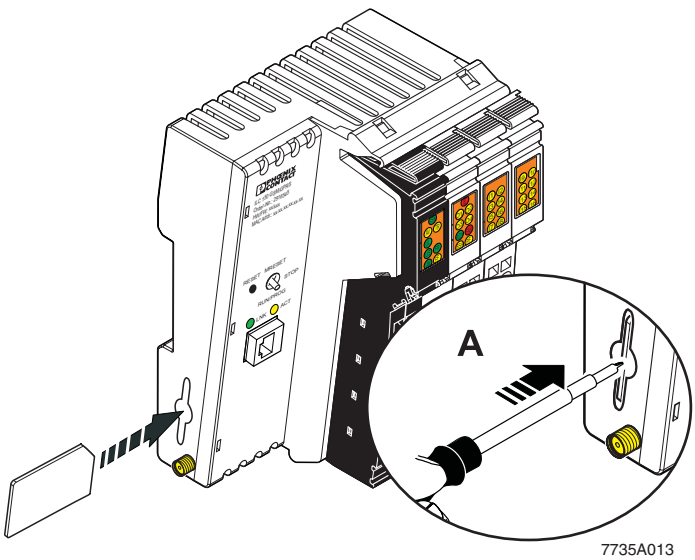


Figure 2-12 Inserting the SIM card

NOTE: Damage to the SIM card/card holder
When inserting/removing the SIM card, do not force the SIM card into the card holder, as this could damage the SIM card and/or card holder.

Inserting the SIM card

- Place a SIM card in the card holder as shown in Figure 2-12. The SIM card must be positioned with the diagonal edge at the top towards the controller.
- Applying light pressure, use a screwdriver to push the SIM card into the card holder as far as possible (A: push/push technology).

Removing the SIM card

- Using a screwdriver, push the SIM card into the card holder as far as possible. When you remove the screwdriver, the SIM card will protrude slightly from the card holder (A: push/push technology).
- Remove the SIM card.

PIN code

- The SIM card can be protected by a 4-digit PIN code.

The PIN code is specified using a parameter of the MOBILE_CONNECT function block (see Section 3.8, "Function blocks for GSM/GPRS mobile phone functions").

For additional information about the function blocks, please refer to the online help for PC WorX.

PIN code error

If the PIN code has been entered incorrectly three times, the PUK code must be entered.

To enter the PUK code, proceed as follows:

- Remove the SIM card from the ILC 150 GSM/GPRS (see "SIM card" on page 2-15).
- Place the SIM card in a mobile phone.
- Enter the PUK code using the mobile phone.

Card contracts

The following card contracts are usually available:

– **Prepaid card** for outgoing data connections, SMS, and voice.
– **Voice card** for outgoing data connections, SMS, and voice.
– **Data card** for incoming and outgoing data connections and SMS.

Most providers offer combined data and voice contracts, whereby various phone numbers for data and voice are assigned to a SIM card. Prepaid cards for incoming data connections are not usually available.

GPRS options are usually available for all cards.

2.13 Antenna

The antenna for this transmitter must be installed at least 20 cm away from people. The antenna for this transmitter must not be installed or operated near/in conjunction with other antennas or transmitters.

Connecting the GSM antenna

- Connect the antenna cable with an SMA connector to the antenna connection of the Inline Controller. Tighten the nut at the antenna connection by hand only.

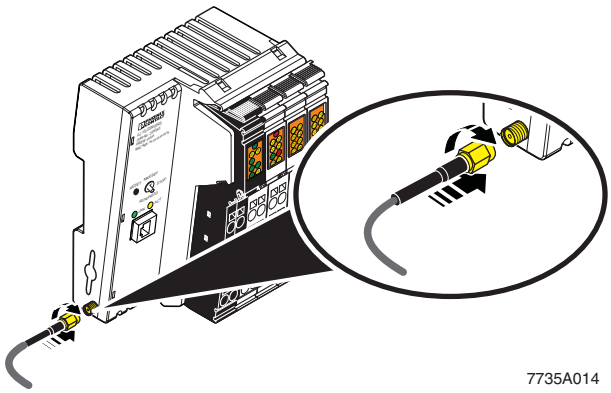


Figure 2-13 Antenna connection with SMA connector

Installing the GSM antenna

- Select an antenna position with a good wireless network signal.
- When using the PSI-GSM-900/1800-ANT antenna (Order No. 2708902), drill a hole measuring 16.5 mm in diameter in the top of the control cabinet.

Please observe the following during installation:
– The antenna has a diameter of 76 mm and is 21 mm high.
– The cable is 2 meters long.

- Secure the antenna using the washer and nut provided:

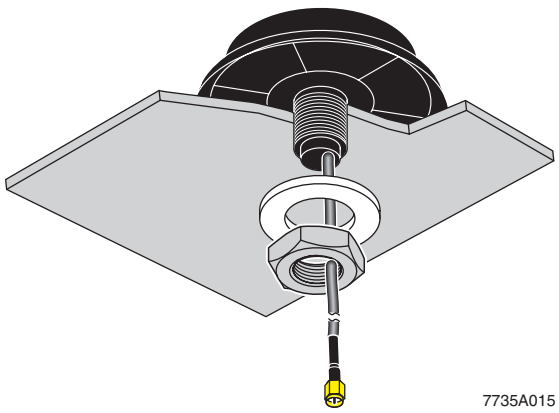


Figure 2-14 Installing the PSI-GSM-900/1800-ANT antenna

2.14 INTERBUS

Observe the information in the "Configuring and installing the INTERBUS Inline product range" user manual IB IL SYS PRO UM E when creating an Inline system (local bus and/or remote bus).

Please note that the Inline Controller does not support the following functions:

- Switching of devices
- Single-channel diagnostics
- Fiber optic diagnostics/optical regulation
- Logical addressing

Only INTERBUS devices with SUPI 3 and SUPI 3 OPC protocol chip can be used with INTERBUS as local bus/remote bus devices.

2.14.1 Local bus

The local bus is automatically created by directly connecting I/O modules to the Inline Controller.

2.14.2 Remote bus

Connect the remote bus to the Inline Controller using one of the following branch terminals. They only differ in the scope of supply.

IBS IL 24 RB-T (Order No. 2727941)

IBS IL 24 RB-T-PAC (Order No. 2861441; including accessories)

The **first branch terminal** must be placed directly after the Inline Controller. In terms of topology, it opens a **remote bus**.

If **additional branch terminals** are used after the first branch terminal, they must be installed directly one after the other (see also notes in the terminal-specific data sheet). In terms of topology, the additional branches are **remote bus branches** with the branch terminal being the first device in the corresponding remote bus branch.

A maximum of 3 branch terminals can be connected to the Inline Controller, each of which opens a remote bus (see Figure 2-2 on page 2-2).

2.15 Power supply

2.15.1 Sizing of the power supply

Use a power supply unit suitable for the currents in your application. The selection depends on the bus configuration, the resulting maximum currents, and the type of supply (separate supply of U_{ILC}, U_M, and U_S, or supply from a power supply unit).

A **power supply without a fall-back characteristic curve** must be used for correct operation of the Inline Controller (see Figure 2-16).
When the Inline Controller is switched on, an increased inrush current is temporarily triggered. The Inline Controller behaves like a capacitive load when it is switched on.

Some electronically controlled power supplies have a fall-back characteristic curve (see Figure 2-15). They are not suitable for operation with capacitive loads.

A primary-switched power supply unit (without fall-back characteristic curve) from the QUINT POWER range (see Phoenix Contact INTERFACE catalog) is recommended for Inline Controller operation.

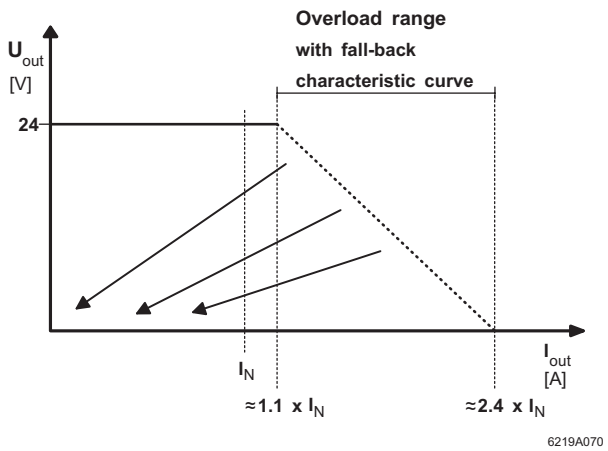


Figure 2-15 Overload range **with** fall-back characteristic curve

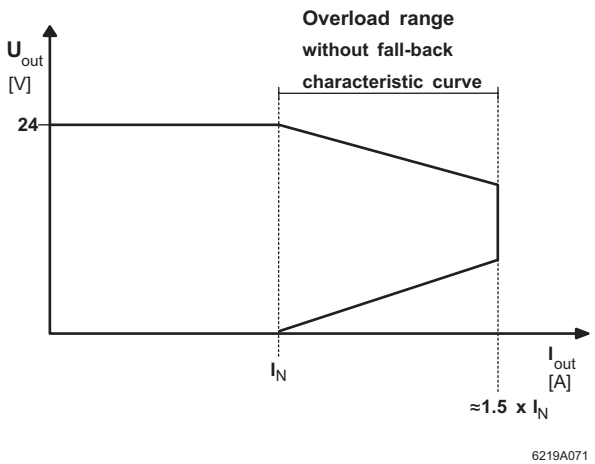


Figure 2-16 Overload range **without** fall-back characteristic curve

2.15.2 Power supply connection

Supply the Inline Controller using external 24 V DC voltage sources. The permissible voltage ranges from 20.4 V DC to 30 V DC (ripple included).
The power consumption of the Inline Controller at 24 V is typically 4.8 W (no local bus devices connected).

Only use power supplies that are suitable for operation with capacitive loads (increased inrush current) (see "Sizing of the power supply" on page 2-19).

1. Connect the power supplies to the connector for power supply as shown in Figure 2-17.
2. Insert the connector in the Inline Controller.
3. Switch on the power supplies.
4. The UL, UM, and US LEDs light up and, after around 10 seconds, the FR and RDY LEDs start flashing.

The Inline Controller is now fully initialized.

If the LEDs do not light up or start flashing, there is a serious error on the Inline Controller. Please contact Phoenix Contact.

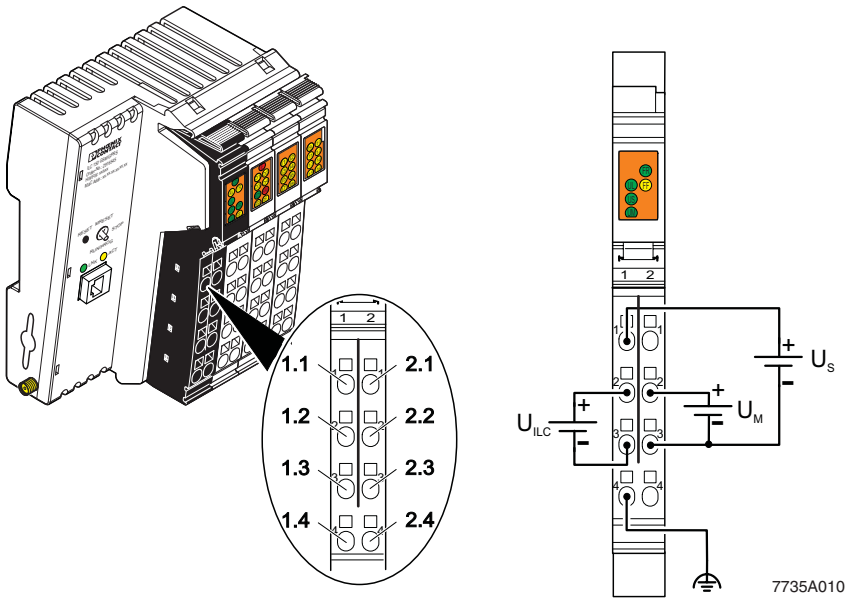


Figure 2-17 Supply voltage connection

Terminal point	Assignment		Remark
Connector 1	**Power connector**		
1.1	24 V DC (U_S)	24 V segment voltage supply	The supplied voltage is directly led to the potential jumper. **NOTE:** Protect the supply voltage externally according to the connected load (local bus devices) with 8 A, maximum. Make sure the external fuse blows in any case.
1.2	24 V DC (U_{ILC})	24 V supply	The 7.5 V communications power (U_L) for the ILC and the connected local bus devices is generated from this voltage. The 24 V analog voltage (U_{ANA}) for the local bus devices is also generated. **NOTE:** Protect the supply voltage externally according to the connected load (local bus devices) with 2 A, maximum. Make sure the external fuse blows in any case.
2.1, 2.2	24 V DC (U_M)	24 V main voltage supply	The main voltage is led to the local bus devices via the potential jumpers. **NOTE:** Protect the supply voltage externally according to the connected load (local bus devices) with 8 A, maximum. Make sure the external fuse blows in any case.
1.3	LGND	Reference potential logic ground	The potential is reference ground for the communications power.
2.3	SGND	Reference potential segment ground	The reference potential is directly led to the potential jumper and is, at the same time, reference ground for the main and segment supply.
1.4, 2.4	FE	Functional earth ground (FE)	Functional earth ground must be connected through the power supply. The contacts are directly connected to the potential jumper and FE springs on the bottom of the housing. The Inline Controller is grounded when it is snapped onto a grounded DIN rail. Functional earth ground is only used to discharge interference.

NOTE:
The maximum total current flowing through the potential jumpers is 8 A.

2.15.3 24 V segment supply/24 V main supply

The segment supply and main supply must have the same reference potential. An electrically isolated voltage area is not possible.

2.15.4 24 V segment supply

There are several ways of providing the segment voltage at connector 1:

1. The segment voltage can be supplied separately at terminal points 1.1 and 2.3 (GND) (see Figure 2-17 on page 2-20).
2. You can jumper connections 1.1 and 2.1 (or 2.2) to ensure that the segment circuit is supplied from the main circuit.
3. You can create a switched segment circuit with a switch between terminal points 1.1 and 2.1 (or 2.2).

NOTE:

The 24 V segment supply has protection against polarity reversal and surge voltage.

It does not have short-circuit protection.

The user must provide short-circuit protection. The rating of the preconnected fuse must be such that the maximum permissible load current of 8 A is not exceeded (total current at U_M and U_S).

2.15.5 24 V main voltage

NOTE:

The 24 V main supply has protection against polarity reversal and surge voltage.

It does not have short-circuit protection.

The user must provide short-circuit protection. The rating of the preconnected fuse must be such that the maximum permissible load current of 8 A is not exceeded (total current at U_M and U_S).

2.15.6 24 V ILC supply

NOTE:

The 24 V ILC supply has protection against polarity reversal and surge voltage. These protective elements are only used to protect the power supply unit.

The rating of the preconnected fuse must be such that the maximum permissible load current of 2 A is not exceeded.

2.15.7 Jumpers

Terminals 1.3 and 2.3 on connector 1 can be jumpered if the communications power and the segment power are not to be electrically isolated.

2.16 Digital inputs and outputs

There are 16 24 V DC inputs and four 24 V DC outputs.

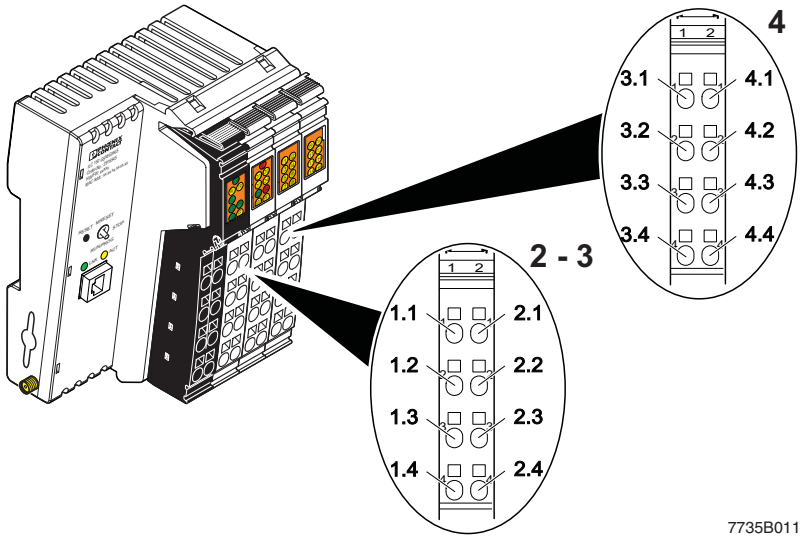


Figure 2-18 Assignment of the terminal points of connectors 2 to 4

Table 2-2 Terminal point assignment

Terminal point	Assignment	Remark
Connector 2	**Output terminal points**	
1.1	O1	Output 1
2.1	O2	Output 2
1.2, 2.2	GND	Ground contact for 2 and 3-wire termination
1.3, 2.3	FE	Functional earth ground for 3-wire termination
1.4	O3	Output 3
2.4	O4	Output 4
	The outputs are supplied with 24 V DC from the segment supply (U_S).	
Connector 3	**Input terminal points**	
1.1	I1	Input 1
1.2	I2	Input 2
1.3	I3	Input 3
1.4	I4	Input 4
2.1	I5	Input 5
2.2	I6	Input 6
2.3	I7	Input 7
2.4	I8	Input 8

Table 2-2 Terminal point assignment (continued)

Terminal point	Assignment	Remark
Connector 4	**Input terminal points**	
3.1	I9	Input 9
3.2	I10	Input 10
3.3	I11	Input 11
3.4	I12	Input 12
4.1	I13	Input 13
4.2	I14	Input 14
4.3	I15	Input 15
4.4	I16	Input 16

The inputs are supplied with 24 V DC from the main supply (U_M).

The outputs have protection when the ground connection is interrupted and must be wired accordingly.

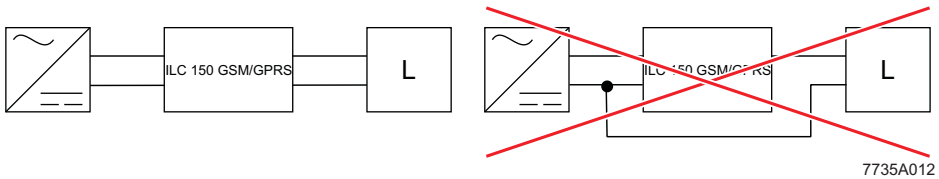


Figure 2-19 Basic wiring of an output with a load (L)

For the connection of actuators with 3-wire technology, Phoenix Contact recommends using connectors for digital 4-channel or 16-channel Inline terminals (not supplied as standard, see "Accessories" on page 5-8).

3 The Inline Controller under PC WorX

3.1 Software version

Using the Inline Controller requires the following PC WorX version:

ILC 150 GSM/GPRS

PC WorX Version 5.20 or later
(part of the AUTOMATIONWORX Software Suite 2008 1.40)

PC WorX Express Version 5.20 or later
(part of the AUTOMATIONWORX Software Suite 2008 1.40)

For information about installing and using PC WorX, please refer to the corresponding Quick Start Guide. This can be downloaded at www.download.phoenixcontact.com and is supplied with the software.

3.2 IP address

BootP is activated by default upon delivery for communication with the Inline Controller via Ethernet.

Initial setting of the IP address can be carried out with the PC WorX software manually by means of a BootP server.

The IP address can be changed later via Ethernet using the PC WorX software.

To set the IP address in PC WorX, proceed as described below:

After assigning the IP address, PC WorX automatically creates a link via TCP/IP as a communication path to the ILC 150 GSM/GPRS.

- Establish an Ethernet connection between your PC and the controller.
- In the menu bar, select the "Extras... BootP/SNMP/TFTP-Configuration..." menu.
- Activate the "BootP Server active" checkbox.

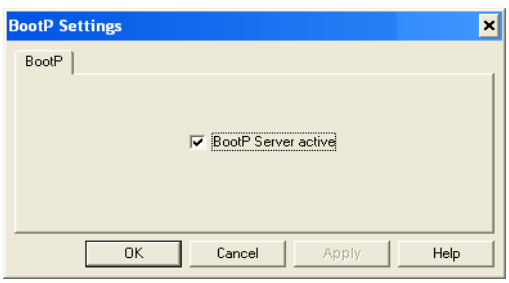


Figure 3-1 "BootP Server active" checkbox

- Switch to the bus configuration workspace.

- Select the Inline Controller node (here: "ILC 150 GSM/GPRS").
- Select the "IP Settings" tab in the "Device Details" window.
- Enter the MAC address of the Inline Controller. This is printed on the device and starts with 00.A0.45.

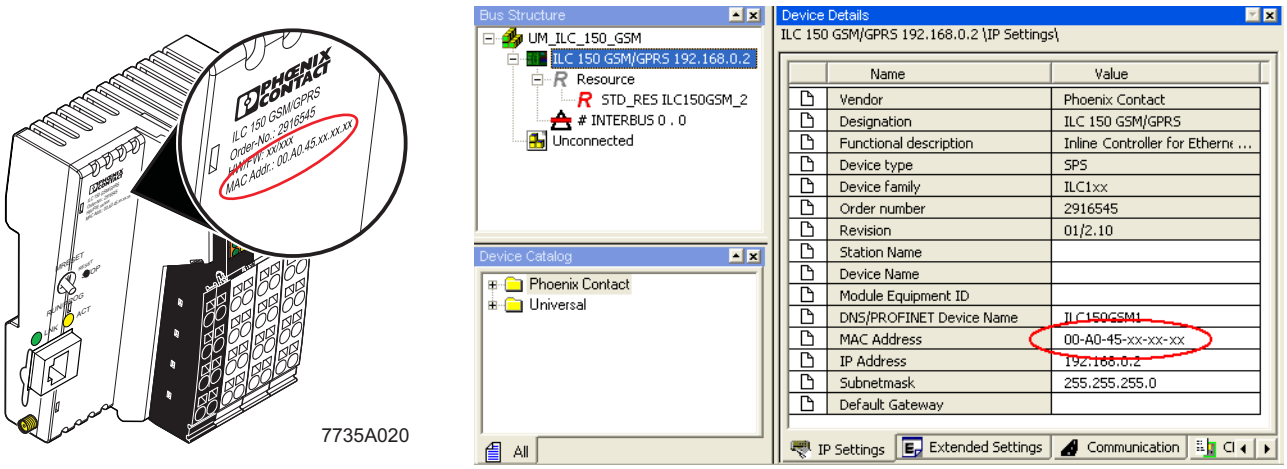


Figure 3-2 Specifying the MAC address

Please note that the default settings are restored in the following step, i.e., all data previously saved on the Inline Controller will be lost.

- Reset the Inline Controller. To do this, hold down the reset button and switch the supply voltage off and on again.

The Inline Controller is temporarily assigned the IP address, which is specified in the project for the Inline Controller. The following message appears in the message window in the "Bus Configurator" tab.

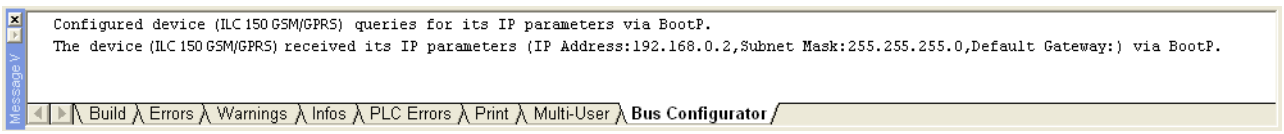


Figure 3-3 Message window following BootP

- Select the "Extended Settings" tab in the "Device Details" window.

The specified IP parameters are displayed under "Manual definition of the TCP/IP settings".

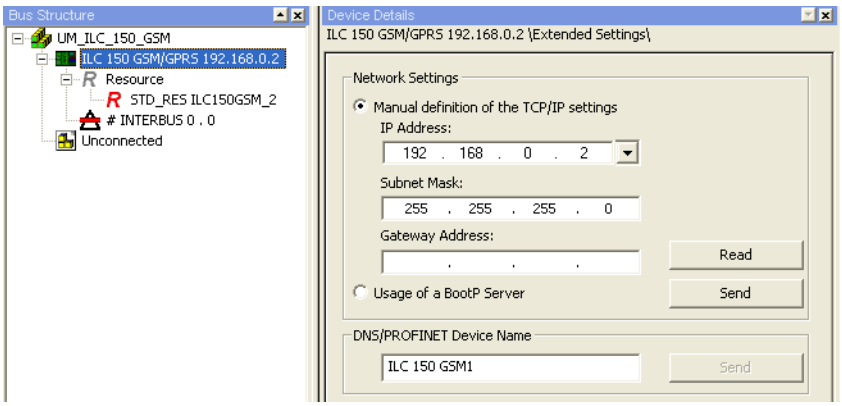


Figure 3-4 IP address of the Inline Controller

- Confirm the displayed IP parameters or your modifications via "Send".

The IP address is now permanently stored on the Inline Controller flash memory.

For additional information about setting the IP address with PC WorX, please refer to the Quick Start Guide for the version of PC WorX used and the ILC 150 starter kit.

3.3 Setting the realtime clock

3.3.1 Setting the realtime clock under PC WorX

The time and date for the internal system clock of the Inline Controller can be set under "Extended Settings" in the "Device Details" window of PC WorX.

To set the realtime clock, proceed as described in the Quick Start Guide for the PC WorX version used.

3.3.2 Setting the realtime clock via SNTP

The Simple Network Time Protocol (SNTP) can be used to synchronize the internal system clock of the Inline Controller with a higher-level control system (e.g., an SNTP server) via an Ethernet connection.

Use the following CPU_Set_Value firmware service ($02CB_{hex}$) to synchronize the system clock. The service activates or deactivates an SNTP client and transfers the required "IP address of the SNTP server" and "Cycle time of the synchronization" parameters.

For test purposes, this service can be executed in the CPU service editor in PC WorX. For your application, program the service accordingly in PC WorX in your application program.

For information about the PC WorX CPU service editor and about programming in PC WorX, please refer to the Quick Start Guide and the online help for the version of PC WorX used.

Program the service in your application program so that it is executed once when the PLC is started. The Inline Controller system clock is synchronized cyclically according to the set cycle time ("Cycle" parameter).

In order to execute the service once when the PLC is started, insert a system task in PC WorX, for example, which calls the service for the "Cold restart", "Warm start", and "Hot restart" system events.

For information about inserting tasks in PC WorX, please refer to the Quick Start Guide and the online help for the version of PC WorX used.

CPU_Set_Value_Request

Syntax: **CPU_Set_Value_Request** **$02CB_{hex}$**

Word 1	Code				
Word 2	Parameter_Count				
Word 3	Variable_Count				
Word 4	Variable_ID				1st system parameter
Word 5	Flags				
Word 6 + 7	IP (MSB)	(Byte 1)	...	(Byte 2)	
	...	(Byte 3)	IP (LSB)	(Byte 4)	
Word 8	Cycle				
	15 8		7 0		

Key:

Code: $02CB_{hex}$ Command code of the request

Parameter_Count: Number of subsequent words

$xxxx_{hex}$ The value depends on the length of the system parameter.

Variable_Count: Number of system parameters to which new values are assigned.

0001_{hex} Call SNTP service

Variable_ID: 0481_{hex} ID of the system parameter to which new values are assigned (call SNTP service).

Flags New value of the system parameter.

0000_{hex} Deactivate SNTP client (values for IP and Cycle that are stored in the parameterization memory are not overwritten).

0003_{hex} Activate SNTP service (values entered for IP and Cycle are stored in the parameterization memory and used for synchronization).

IP (MSB ... LSB) IP address of the SNTP server (32-bit value)

Example: IP address = 192.168.0.2

Byte 1: $C0_{hex}$

Byte 2: $A8_{hex}$

Byte 3: 00_{hex}

Byte 4: 02_{hex}

Cycle $xxxx_{hex}$ Request cycle in minutes
Value range: 01_{hex} to $C350_{hex}$
(1 ... 50,000 minutes)

CPU_Set_Value_Confirmation

Syntax: **CPU_Set_Value_Confirmation** **$82CB_{hex}$**

Positive message

Word 1	Code
Word 2	Parameter_Count
Word 3	Result

Negative message

Word 1	Code
Word 2	Parameter_Count
Word 3	Result
Word 4	Add_Error_Info

15 0

Key:

Code: $82CB_{hex}$ Message code of the confirmation

Parameter_Count: Number of subsequent words

With a positive message:

0001_{hex} 1 parameter word

With a negative message:

0002_{hex} 2 parameter words

Result: Result of the service processing

0000_{hex} Indicates a positive message.
The controller processed the service successfully.

$xxxx_{hex}$ Indicates a negative message.
The controller could not process the service successfully. The "Result" parameter indicates why the service could not be processed.

Add_Error_Info: Additional information about the error cause (e.g., invalid parameter)

3.4 Download changes

This function is supported by firmware Version 3.x or later.

3.5 Parameterization memory and Internet Explorer

To delete files or store user-specific files on the internal parameterization memory, proceed as follows:

The FTP function must be activated in Internet Explorer. See "Internet Explorer FTP function" on page 3-8.

- Switch to the bus configuration workspace in PC WorX.
- Select the control system, e.g., "ILC 150 GSM/GPRS", in the "Bus Structure" window.
- Select the "Extended Settings" tab in the "Device Details" window.
- Open Internet Explorer from this window by clicking on the "Open FTP Folder on Device" button.

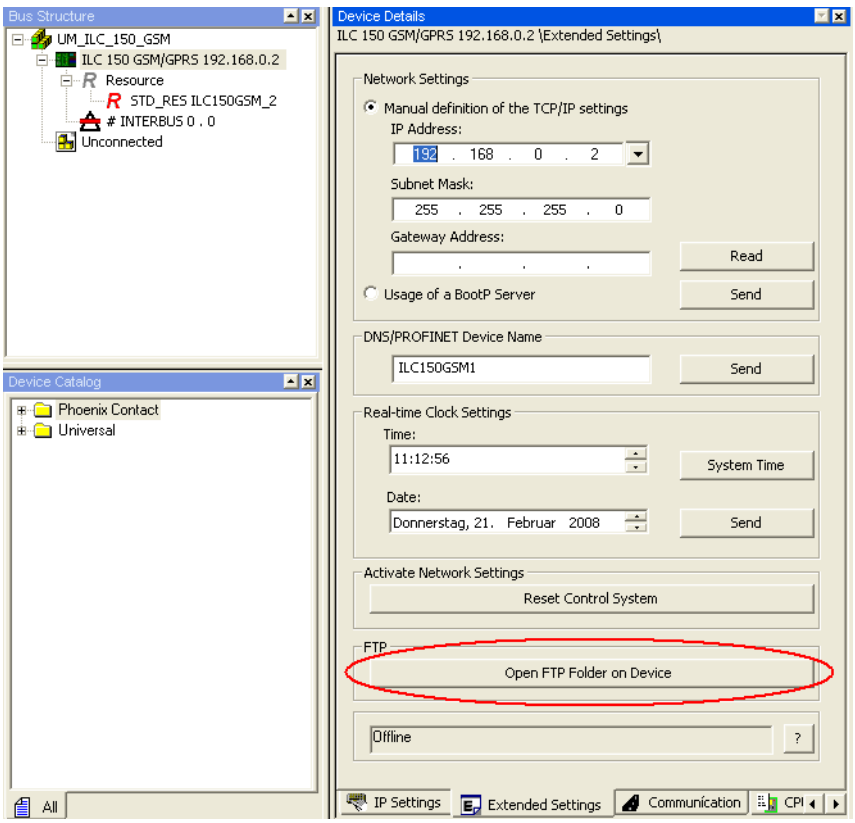


Figure 3-5 Extended Settings: Open FTP Folder on Device

The file structure, which is stored in the parameterization memory, is displayed in the Internet Explorer window.

Data may only be copied or deleted in the parameterization memory. Do not edit any files as Internet Explorer does not store modified data.

To view the current state, update the display after every action using "View/Refresh".

3.5.1 Internet Explorer FTP function

- Enable this setting in Internet Explorer under "Options... Internet Properties... Advanced".

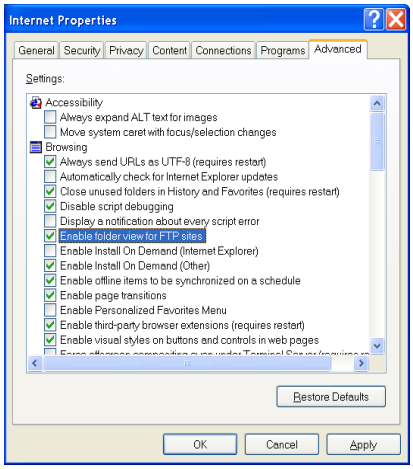


Figure 3-6 Internet Properties: Enable folder view for FTP sites

3.5.2 Activating/deactivating the FTP server

To protect the Inline Controller against unauthorized access, it may be necessary to deactivate the FTP server. The CPU_Set_Value_Request service with Var ID 0172_{hex} is used for this. This service activates or deactivates the FTP server for the runtime of the firmware. The set FTP server state is stored retentively and mapped to the ETH_SRV_FTP_ACTIVE system variables. This setting is restored the next time the Inline Controller is rebooted.

Value range for the CPU_Set_Value_Request service:

Var ID	0172_{hex}	
Value	0000_{hex}	Deactivate FTP server
	0001_{hex}	Activate FTP server

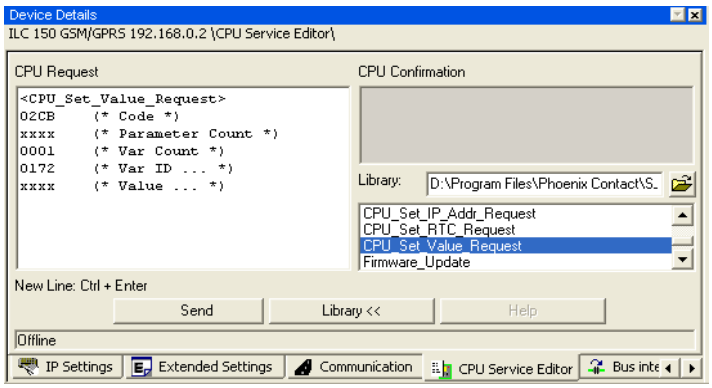


Figure 3-7 Deactivating the FTP server

3.5.3 Activating/deactivating the HTTP server

To protect the Inline Controller against unauthorized access, it may be necessary to deactivate the HTTP server. The CPU_Set_Value_Request service with Var ID 0173_{hex} is used for this. This service activates or deactivates the HTTP server for the runtime of the firmware. The set HTTP server state is stored retentively and mapped to the ETH_SRV_HTTP_ACTIVE system variables. This setting is restored the next time the Inline Controller is rebooted.

Value range for the CPU_Set_Value_Request service:

Var ID	0173_{hex}	
Value	0000_{hex}	Deactivate HTTP server
	0001_{hex}	Activate HTTP server

3.6 Function blocks for handling files in the parameterization memory

The function blocks are used to access files from within the application program. Some of the blocks support multiple instantiation. This means that it is possible to work with a number of different files within the same project. The blocks perform the standard functions that are required for typical file access operations.

The FILE_NOTIFY block is available in addition to the blocks for typical file access operations. This block can be used to detect files that have been modified in a directory containing user files. These modifications may include:

– Deletion of one or more files
– Writing of one or more new files
– Modification of one or more existing files

Both modifications made to this directory via FTP (remote) and modifications made locally via function blocks or firmware services can be detected.

All file operations are subject to the following restrictions:
No directory hierarchies are supported. All file operations only affect the root directory of the parameterization memory.

The function blocks are valid for:

Order designation	From hardware version	From firmware version
ILC 150 GSM/GPRS	02	2.10

Table 3-1 Overview of function blocks

Function block	Short description
FILE_OPEN	Opens a file with a specific name
FILE_CLOSE	Closes a file with a specific handle
FILE_READ	Reads from a file with a specific handle
FILE_WRITE	Writes to a file with a specific handle
FILE_REMOVE	Deletes a file with a specific name
FILE_TELL	Determines the current position of the file pointer in a file
FILE_SEEK	Moves the current file pointer to a new position
FILE_NOTIFY	Displays files that have recently been created, deleted or modified

The function blocks for handling files in the parameterization memory are described in the PC WorX online help.

3.7 Function blocks for TCP/IP and UDP/IP communication

The function blocks are used to establish Ethernet communication between two communication partners. The existing IEC 61131-5 blocks have thus been extended to include a TCP/IP mode and a UDP/IP mode.

Possible applications include:

– Communication between two Phoenix Contact controllers (e.g., ILC - RFC, ILC - FC, ILC - ILC)
– Communication between a Phoenix Contact controller and any other TCP/IP-compatible device (e.g., ILC - PC, ILC - PLC)
– Wireless data transmission between a Phoenix Contact controller and any other UDP/IP-compatible device (e.g., ILC - PC, ILC - PLC)

Implement all time and connection monitoring in the application program.

The Inline Controller supports eight TCP/IP or UDP/IP connections to another communication partner.

The function blocks are valid for:

Order designation	Blocks	From hardware version	From firmware version
ILC 150 GSM/GPRS	IEC 61131-5	02	2.10
	TCP/IP		
	UDP/IP		

Table 3-2 Overview of function blocks

Function block	Short description
IP_CONNECT	Establishes a connection between two communication partners
IP_USEND	Transmits data to a communication partner
IP_URCV	Receives data from a communication partner

The communication blocks are described in the PC WorX online help.
The extensions for the TCP/IP and UDP/IP function blocks are described in the "TCP/UDP COMMUNICATION" application note.

3.8 Function blocks for GSM/GPRS mobile phone functions

In the latest firmware version, the device supports the sending and receiving of SMS via the GSM modem. The function for transmitting data via a GPRS connection using the GSM modem is supported in firmware Version 3.x or later.

The function blocks are used to send and receive SMS via a mobile phone GSM/GPRS connection.

The function blocks are valid for:

Order designation	From hardware version	From firmware version
ILC 150 GSM/GPRS	02	2.10

Table 3-3 Overview of function blocks

Function block	Short description
MOBILE_CONNECT	This function block is used to: – Parameterize and enable/disable the GSM modem of the controller – Switch between "SMS" and "transparent" mode (supported in firmware Version 3.x). In addition, the block provides information about the current mobile phone provider and the receive field strength of the GSM modem.
SMS_SEND	This block can be used to send an SMS using the GSM modem of the controller.
SMS_RECEIVE	This block can be used to receive an SMS using the GSM modem of the controller.

The "SMS_SEND" and "SMS_RECEIVE" function blocks can be instantiated multiple times, for example, to exchange specific SMS with multiple devices of an application.

The function blocks for GSM/GPRS mobile phone functions are described in the PC WorX online help.

3.9 Function blocks for PCP communication

The function blocks are used to establish PCP communication between the Inline Controller and PCP devices in INTERBUS.

The Inline Controller supports connections to a maximum of eight PCP devices.

The function blocks are valid for:

Order designation	From hardware version	From firmware version
ILC 150 GSM/GPRS	02	2.10

Table 3-4 Overview of function blocks

Function block	Short description
PCP_CONNECT	This block can be used to set up communication connections to each PCP device in INTERBUS.
PCP_WRITE	This block enables PCP objects to be written.
PCP_READ	This block enables data to be read from PCP objects.
PCP_SERVER	This block enables PCP service indications to be received and responses to be sent.

The communication blocks are described in the PC WorX online help.

3.10 Alignment

The alignment of the data elements in the Inline Controller memory can result in "data gaps" when storing data in the memory. The compiler automatically fills these gaps with padding bytes during the compiler process in order to prevent incorrect processing.

The disadvantage of the "automatic" filling of data gaps becomes apparent when data is transmitted from the Inline Controller to another controller. If this controller does not know the memory algorithm of the Inline Controller it will interpret the received data incorrectly.

It is therefore useful to program the filling of data gaps in your application program. Data transmissions to other controllers can thus be taken into consideration. For example, use byte arrays with an even number of bytes and/or word arrays in order to avoid data gaps in your application program.

The following should be taken into consideration when creating the program:

– Create data types in flat structures, i.e., do not nest user-defined data types.
– Insert padding bytes manually in order to ensure the uniform size and layout of the data types.
– When inserting padding bytes, please observe the memory alignment method of the controllers used in the application (1-byte, 2-byte or 4-byte alignment).

Program example with data gaps

The following program example shows how data gaps are filled.

```
1   TYPE
2       Struct1 :
3       STRUCT
4           ByteElement :   BYTE;
5           WordElement :   WORD;
6       END_STRUCT:
7
8       Struct2 :
9       STRUCT
10          WordElement :   WORD;
11          ByteElement :   BYTE;
12      END_STRUCT:
13
14      Struct3 :
15      STRUCT
16          ByteElement1    :   BYTE;
17          ByteElement2    :   BYTE;
18      END_STRUCT:
19
20      Struct4 :
21      STRUCT
22          Struct2Element  :   Struct2;
23          Struct3Element  :   Struct3;
24      END_STRUCT:
25
26      Array1  :   ARRAY   [0..1]  OF  Struct2;
27  END_TYPE
```

Figure 3-8 Example programming

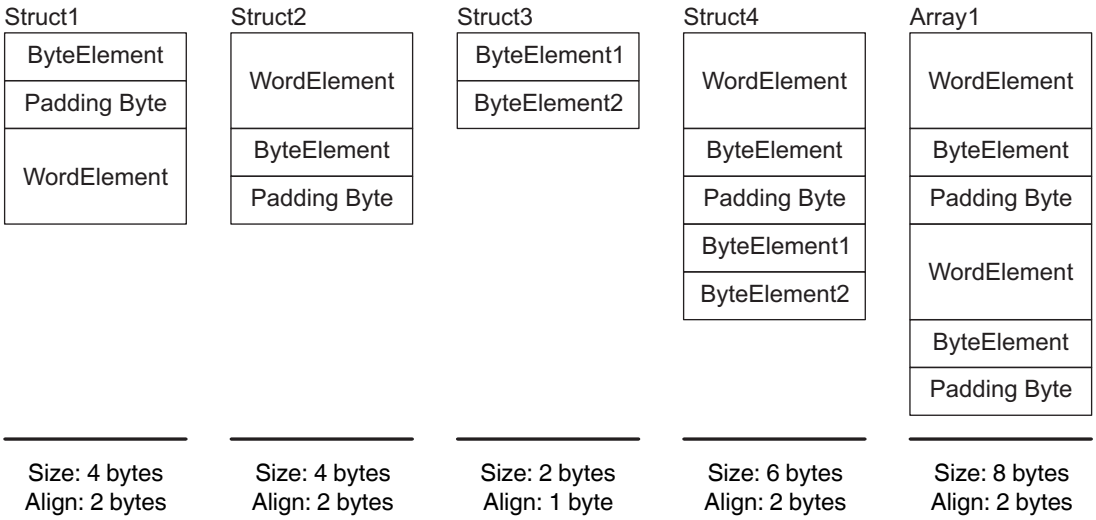


Figure 3-9 Alignment - padding bytes in data gaps

Struct1 receives a padding byte after the ByteElement so that the WordElement is at a WORD address (address that can be divided by 2 leaving no remainder). The alignment of the overall structure is based on the data type used with maximum alignment. In this case the WordElement specifies the alignment.

The size of Struct2 is calculated based on the elements used and the resulting alignment. The corresponding number of padding bytes is inserted so that the size of the data type with the value of the alignment can be divided by 2 leaving no remainder (data type size modulo alignment = 0).

Struct3 does not receive any padding bytes as the maximum alignment corresponds to one byte.

Due to the padding bytes that belong to the Struct2 structure, the Struct3 structure starts at an even address in Struct4.

Array1 receives 2 padding bytes, which corresponds to two consecutive Struct2 structures.

Program example without data gaps

The following program shows an example of how the filling of data gaps may appear in your application program. Fill data gaps, which are to be expected due to the memory alignment, with application data (padding bytes in Figure 3-10).

```
TYPE
    Struct1 :
    STRUCT
        ByteElement :   BYTE;
        ByteElement :   BYTE;   (*Padding-Byte*)
        WordElement :   WORD;
    END_STRUCT:

    Struct2 :
    STRUCT
        WordElement :   WORD;
        ByteElement :   BYTE;
        ByteElement :   BYTE;   (*Padding-Byte*)
    END_STRUCT:

    Struct3 :
    STRUCT
        ByteElement1    :   BYTE;
        ByteElement2    :   BYTE;
    END_STRUCT:

    STRUCT4 :
    STRUCT
        Struct2Element  :   Struct2;
        Struct3Element  :   Struct3;
    END_STRUCT:

    Array1  :   ARRAY   [0..1]  OF  Struct2;
END_TYPE
```

Figure 3-10 Example programming with padding bytes

4 System variables and status information

4.1 General information

This section describes the special program functions of the PC WorX software that are available for the Inline Controller.

The Inline Controller has a register set, which is used for diagnostics and easy control of the bus system. The diagnostic data is stored in the diagnostic status register and the diagnostic parameter register. These registers are available to the application program as system variables (system flags, global variables).

Operating states, error states, and additional information about the INTERBUS system can be evaluated in the application program.

For additional information about diagnostics, please refer to the following user manual:
– INTERBUS Diagnostics Guide
IBS SYS DIAG DSC UM E Order No. 2747293

4.2 Status register for local digital inputs and outputs

The following system variables can be used to read the local digital input and output states and to write the local digital output states.

Table 4-1 System variables of the status register for local digital inputs and outputs

System variable	Type	Meaning
ONBOARD_INPUT	WORD	State of all local inputs
ONBOARD_INPUT_BIT0	BOOL	State of local input IN1
ONBOARD_INPUT_BIT1	BOOL	State of local input IN2
ONBOARD_INPUT_BIT2	BOOL	State of local input IN3
ONBOARD_INPUT_BIT3	BOOL	State of local input IN4
ONBOARD_INPUT_BIT4	BOOL	State of local input IN5
ONBOARD_INPUT_BIT5	BOOL	State of local input IN6
ONBOARD_INPUT_BIT6	BOOL	State of local input IN7
ONBOARD_INPUT_BIT7	BOOL	State of local input IN8
ONBOARD_INPUT_BIT8	BOOL	State of local input IN9
ONBOARD_INPUT_BIT9	BOOL	State of local input IN10
ONBOARD_INPUT_BIT10	BOOL	State of local input IN11
ONBOARD_INPUT_BIT11	BOOL	State of local input IN12
ONBOARD_INPUT_BIT12	BOOL	State of local input IN13
ONBOARD_INPUT_BIT13	BOOL	State of local input IN14
ONBOARD_INPUT_BIT14	BOOL	State of local input IN15

Table 4-1 System variables of the status register for local digital inputs and outputs (continued)

System variable	Type	Meaning
ONBOARD_INPUT_BIT15	BOOL	State of local input IN16
ONBOARD_OUTPUT_BIT0	BOOL	State of local output OUT1
ONBOARD_OUTPUT_BIT1	BOOL	State of local output OUT2
ONBOARD_OUTPUT_BIT2	BOOL	State of local output OUT3
ONBOARD_OUTPUT_BIT3	BOOL	State of local output OUT4
ONBOARD_OUTPUT_OVERLOAD_0_3	BOOL	One local output overloaded

4.3 Diagnostic status register

Information about the operating state of the Inline Controller is stored in the diagnostic status register. Every bit in the diagnostic status register is assigned a certain Inline Controller state.

The following system variables can be used to read the diagnostic status register information.

Table 4-2 System variables of the diagnostic status register

System variable	Type	Meaning
MASTER_DIAG_STATUS_REG_USER	BOOL	User error/parameterization error
MASTER_DIAG_STATUS_REG_PF	BOOL	Peripheral fault
MASTER_DIAG_STATUS_REG_BUS	BOOL	Bus error
MASTER_DIAG_STATUS_REG_CTRL	BOOL	Error on the Inline Controller/hardware fault
MASTER_DIAG_STATUS_REG_DTC	BOOL	Diagnostic routine active
MASTER_DIAG_STATUS_REG_RUN	BOOL	Data transmission active
MASTER_DIAG_STATUS_REG_ACT	BOOL	Selected configuration ready to operate
MASTER_DIAG_STATUS_REG_RDY	BOOL	Inline Controller ready to operate
MASTER_DIAG_STATUS_REG_BSA	BOOL	Bus segment aborted
MASTER_DIAG_STATUS_REG_SYSFAIL	BOOL	System failure
MASTER_DIAG_STATUS_REG_RES	BOOL	Standard function processed negatively
MASTER_DIAG_STATUS_REG_SYNCRES	BOOL	Synchronization error occurred
MASTER_DIAG_STATUS_REG_DCR	BOOL	Faulty data cycles
MASTER_DIAG_STATUS_REG_WARN	BOOL	Defined warning time exceeded
MASTER_DIAG_STATUS_REG_QUAL	BOOL	Defined error density exceeded
MASTER_DIAG_STATUS_REG_SSINFO	BOOL	Pending message
MASTER_DIAG_STATUS_REG_HI	BYTE	Master diagnostic status register, high byte
MASTER_DIAG_STATUS_REG_LOW	BYTE	Master diagnostic status register, low byte

4.4 Diagnostic parameter register

The diagnostic parameter register provides additional information about the error indicated in the diagnostic status register. The following information is stored in the diagnostic parameter register:

– Error location
– Error code

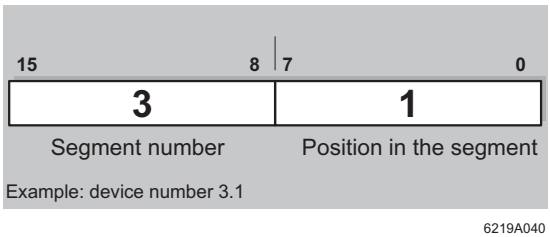


Figure 4-1 Error location in the diagnostic parameter register

Special case: If an interface error cannot be located, the value 128 is indicated in the diagnostic parameter register, i.e., bit 7 is set.

The diagnostic parameter register is rewritten whenever an error occurs. The diagnostic parameter register contains the value "0" if no errors are detected.

Table 4-3 System variables of the diagnostic parameter register

System variable	Type	Meaning
MASTER_DIAG_PARAM_REG_HI	BYTE	Diagnostic parameter register, high byte
MASTER_DIAG_PARAM_REG_LOW	BYTE	Diagnostic parameter register, low byte
MASTER_DIAG_PARAM_2_REG_HI	BYTE	Extended diagnostic parameter register, high byte
MASTER_DIAG_PARAM_2_REG_LOW	BYTE	Extended diagnostic parameter register, low byte

4.5 IEC 61131 runtime system

There is a separate group of variables for the IEC 61131 runtime system.

Table 4-4 System variables of the IEC 61131 runtime system

System variable	Type	Meaning
PLCMODE_ON	BOOL	PLC status ON: The runtime system on the Inline Controller is ready to operate.
PLCMODE_RUN	BOOL	PLC status RUN: The application program is running.
PLCMODE_STOP	BOOL	PLC status STOP: The application program is currently not running.
PLCMODE_HALT	BOOL	PLC status HALT: The application program was stopped at an unspecified point.
PLCDEBUG_BPSET	BOOL	Breakpoint set: At least one breakpoint has been set in the application program.
PLCDEBUG_FORCE	BOOL	Variable(s) forced: At least one variable is being continuously overwritten (forced) by PROGRAM WORX.
PLCDEBUG_POWERFLOW	BOOL	Powerflow ON: In "Powerflow" mode, you can see which parts of your application program are being processed. This bit indicates whether "Powerflow" mode is active.
PLC_TICKS_PER_SEC	INT	System ticks per second: This variable shows how many pulses the system clock of the Inline Controller delivers per second.
PLC_SYS_TICK_CNT	DINT	Number of system ticks: This variable shows the total number of pulses delivered by the system clock since the last startup.
PLC_TASK_AVAILABLE	INT	Number of available PLC tasks
PLC_SYSTASK_AVAILABLE	INT	Number of available system tasks
PLC_MAX_ERRORS	DINT	Maximum number of "Errors, Warnings, and Logging Events". If this maximum number is reached, the controller is stopped.
PLC_ERRORS	DINT	Maximum number of "Errors, Warnings, and Logging Events" currently entered.
PLC_TASK_DEFINED	INT	Number of tasks used
PLC_TASK_1	Record, elements = 17	Information about task 1
:	:	:
PLC_TASK_8	Record, elements = 9	Information about task 8

4.6 Control processor

The system variables listed below show the states of the diagnostic status register on the control processor of the Inline Controller.

Table 4-5 System variables of the control processor

System variable	Type	Meaning
COP_DIAG_STATUS_REG_RT_ERR	BOOL	A runtime error (out of realtime) has occurred on the control processor.
COP_DIAG_STATUS_REG_FAT_ERR	BOOL	A fatal error has occurred on the control processor. Division by zero, for example, leads to a fatal error.
COP_DIAG_STATUS_REG_WARN	BOOL	A warning has been issued on the control processor.
COP_DIAG_STATUS_REG_PON	BOOL	Power ON (COP): The control processor is ready to operate.
COP_DIAG_STATUS_REG_FC_RUN	BOOL	Runtime system RUN
COP_DIAG_STATUS_REG_FC_STOP	BOOL	Runtime system STOP
COP_DIAG_STATUS_REG_FC_HALT	BOOL	Runtime system HALT
COP_DIAG_STATUS_REG_FC_LDG	BOOL	Runtime system LOADING
COP_DIAG_STATUS_REG_FC_DBG	BOOL	Runtime system DEBUG
COP_DIAG_STATUS_REG_FC_RDO	BOOL	Runtime system READONLY
COP_DIAG_PARAM_REG	WORD	Diagnostic parameter register of the control processor
COP_DIAG_PARAM_2_REG	WORD	Extended diagnostic parameter register of the control processor

The system variable below shows status information about the control processor of the Inline Controller.

Table 4-6 System variable of the control processor

System variable	Type	Meaning
COP_CPU_LOAD_WARNING	BOOL	The control processor is reaching the limits of its capacity.

4.7 Battery, realtime clock

Table 4-7 System variables of the battery and realtime clock

System variable	Type	Meaning
RTC_BATTERY_LOW	BOOL	The realtime clock battery is low.
RTC_DATA_INVALID	BOOL	Realtime clock data is invalid.

4.8 Power supplies

Table 4-8 System variables of the power supplies

System variable	Type	Meaning
POWER_SUPPLY_MAIN_OK	BOOL	The 24 V main power supply is OK.
POWER_SUPPLY_INPUTS_OK	BOOL	The 24 V power supply for the local inputs is OK.
POWER_SUPPLY_OUTPUTS_0_3_OK	BOOL	The 24 V power supply for the local outputs is OK (bit 0 to 3).

4.9 Mode selector switch

Table 4-9 System variables of the mode selector switch

System variable	Type	Meaning
KEY_SWITCH_RESET	BOOL	The mode selector switch is in the MRESET position.
KEY_SWITCH_STOP	BOOL	The mode selector switch is in the STOP position.
KEY_SWITCH_RUN_PROG	BOOL	The mode selector switch is in the RUN_PROG position.

4.10 System time

Table 4-10 System variables of the system time

System variable	Type	Meaning
RTC_HOURS	INT	System time (hours)
RTC_MINUTES	INT	System time (minutes)
RTC_SECONDS	INT	System time (seconds)
RTC_DAY	INT	System time (day)
RTC_MONTH	INT	System time (month)
RTC_YEAR	INT	System time (year)

5 Technical data and ordering data

5.1 Technical data

General data	
CE conformance	According to R&TTE directive 1999/5/EC
Dimensions	85 mm x 120 mm x 69 mm
Weight	285 g, approximately
Connection data for connectors	
Connection method	Spring-cage terminals
Conductor cross-section	0.2 mm^2 to 1.5 mm^2 (solid or stranded), 24 - 16 AWG

General supply

Use a **power supply without fall-back characteristic curve** (see "Sizing of the power supply" on page 2-19).

24 V main supply U_M	
Connection method	Spring-cage terminals
Nominal value	24 V DC
Tolerance	-20%/+20%
Ripple	±5%
Current consumption at nominal voltage (typical)	6 mA + 7 mA for each input set
Current consumption at nominal voltage (maximum)	8 A
Continuation	Via potential routing
Safety equipment	
Surge voltage	Input protective diodes (can be destroyed by permanent overload) Pulse loads up to 1500 W are short circuited by the input protective diode.
Polarity reversal	Parallel diodes for protection against polarity reversal; in the event of an error the high current through the diodes causes the preconnected fuse to blow.

NOTE:

Provide external fuses for the 24 V area. The power supply unit must be able to supply 4 times (400%) the nominal current of the external fuse, to ensure that the fuse blows safely in the event of an error.

24 V segment supply U_S	
Connection method	Spring-cage terminals
Nominal value	24 V DC
Tolerance	-20%/+20%
Ripple	±5%
Current consumption at nominal voltage (typical)	10 mA + 10 mA for each output set + load
Current consumption at nominal voltage (maximum)	8 A
Continuation	Via potential routing

24 V segment supply U_S (continued)	
Safety equipment	
Surge voltage	Input protective diodes (can be destroyed by permanent overload) Pulse loads up to 1500 W are short circuited by the input protective diode.
Polarity reversal	Parallel diodes for protection against polarity reversal; in the event of an error the high current through the diodes causes the preconnected fuse to blow.

NOTE:

Provide external fuses for the 24 V area. The power supply unit must be able to supply 4 times (400%) the nominal current of the external fuse, to ensure that the fuse blows safely in the event of an error.

24 V supply U_{ILC}	
Connection method	Spring-cage terminals
Nominal value	24 V DC
Tolerance	-15%/+20% (according to EN 61131-2)
Ripple	±5%
Permissible range	20.4 V DC to 30 V DC
Current consumption at nominal voltage (minimum)	70 mA (no-load operation, i.e., no local bus devices connected, bus inactive)
Current consumption at nominal voltage (typical)	200 mA
Current consumption at nominal voltage (maximum)	860 mA (360 mA communications power + 500 mA analog power supply)
Safety equipment	
Surge voltage	Input protective diodes (can be destroyed by permanent overload) Pulse loads up to 1500 W are short circuited by the input protective diode.
Polarity reversal	Serial diode in the lead path of the power supply unit; in the event of an error only a low current flows. In the event of an error, no fuse trips within the external power supply unit.

NOTE:

Observe the current consumption of the Inline terminals

Observe the logic current consumption of each device when configuring an Inline station. It is specified in every terminal-specific data sheet. The current consumption can differ depending on the individual terminal. The permissible number of devices that can be connected therefore depends on the specific station structure.

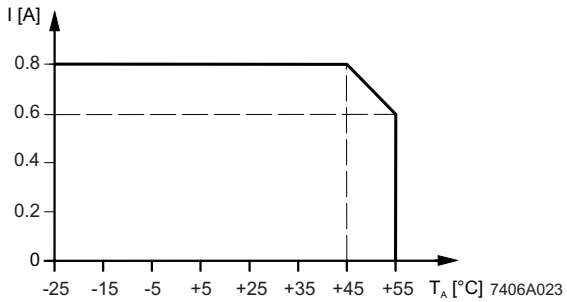
Protection of the external power supply unit

Ensure protection of 2 A by fuses through the external power supply unit.

7.5 V communications power (potential jumper)

Nominal value	7.5 V DC
Tolerance	±5%
Ripple	±1.5%
Maximum output current	0.8 A DC (internally protected against short circuit)

Derating



I [A] Logic current in A
T_A [°C] Ambient temperature in °C

24 V analog supply (potential jumper)

Nominal value	24 V DC
Tolerance	-15%/+20%
Ripple	±5%
Maximum output current	0.5 A DC
Safety equipment	Electronic short-circuit protection

INTERBUS

Number of I/O points	4096, maximum
Number of data words	256, maximum
Number of bus segments	32, maximum
Transmission speed	500 kbps or 2 Mbps

This speed is automatically set according to the connected Inline terminals. Only use terminals with a uniform transmission speed in the entire connected Inline system (local bus and remote bus).

Transmission reliability	CR check (hamming distance: 4)
Protocol	EN 50254

Number of devices in the INTERBUS system

Total number of bus devices	128, maximum
Number of remote bus devices	32, maximum
Number of PCP devices	8
Number of remote bus levels	4, maximum (see Section 2.2 on page 2-2)

Network interface	
Type	Ethernet 10Base-T and 100Base-TX
Speed	10 Mbits (10Base-T), 100 Mbits (100Base-TX) half duplex, full duplex, auto negotiation

This speed cannot be set manually. It is set automatically by means of auto negotiation.

Connection method	Cat. 5 twisted pair cable RJ45 female connector

Inline local bus	
interface	Inline local bus
Electrical isolation	No
Number of devices	128, maximum

Digital inputs	
Number	16
Input design	According to EN 61131-2 Type 1
Definition of switching thresholds	
Maximum low-level voltage	5 V DC
Minimum high-level voltage	15 V DC
Nominal input voltage	24 V DC
Permissible range	-0.5 V < U_{IN} < +30 V DC
Nominal input current at 24 V	7 mA, typical; 15 mA, maximum
Hardware filter times (typical)	
Inputs I1 to I16	
Signal change 0 -> 1 Signal change 1 -> 0	5 ms 5 ms
Permissible cable length to the sensor	30 m (to ensure conformance with EMC directive 89/336/EEC)
Use of AC sensors	AC sensors in the voltage range < U_{IN} are limited in application (according to the input design)

Digital outputs	
Number	4
Output design	Protected outputs according to EN 61131-2
Nominal output voltage	24 V DC
Nominal output current	500 mA

Diagnostic and status indicators	
IEC 61131 runtime system (PLC)	FR, FF
Ethernet (ETH)	LINK, ACT
INTERBUS diagnostics (IL)	RDY, BSA, FAIL, PF
Digital inputs and outputs	I1 to I16, E, O1 to O4
Supply voltages	US, UM, UL

IEC 61131 runtime system	
Programming system	PC WorX
Speed	1.5 ms for 1 K instructions, typical
Shortest cycle time (for cyclic task)	1 ms
Program memory	512 KB, 48 K instructions in IL, typical
Data memory	512 KB
Memory for retentive data	48 KB NVRAM
Number of control tasks	8
Parameterization memory	4 MB Flash memory (100,000 write access operations per sector, typical)

Please note that the number of write access operations to the parameterization memory is limited.

We recommend that you limit the number of write access operations on the parameterization memory in your application program by first storing data on the data memory and/or the memory for retentive data (NVRAM). Write access operations on the parameterization memory for small volumes of data (bit, byte) should not be possible in your application program. Data should only be transferred from the data memory/memory for retentive data to the parameterization memory if the data memory/memory for retentive data is full, i.e., data must be deleted first to enable further write access operations.

Realtime clock	
Accuracy	1 minute/week, maximum
Power reserve	3 days

Ambient conditions	
Degree of protection	IP20 (EN 60529:1991)
Permissible temperature (operation)	-25°C to +55°C
Permissible temperature (storage/transport)	-25°C to +85°C

This temperature range is only guaranteed if the Inline Controller is mounted horizontally.

Permissible humidity (operation/storage/transport)	10% to 95% according to DIN EN 61131-2
Permissible air pressure (operation/storage/transport)	70 kPa to 106 kPa (up to 3000 m above sea level)
Vibration	5g

GSM

This device meets the requirements of Part 15 of the following FCC standard: FCC ID: RI7GE864.

Maximum antenna gain	≤ 3 dBi

The antenna for this transmitter must be installed at least 20 cm away from people. The antenna for this transmitter must not be installed or operated near/in conjunction with other antennas or transmitters.

Frequencies	850 MHz, 900 MHz, 1800 MHz, 1900 MHz (EGSM)
Transmission power	2 W at 850 MHz and 900 MHz 1 W at 1800 MHz and 1900 MHz
SIM interface	3 V SIM card
Transmission speed	Automatic adjustment
DCE/DCE	300 baud ... 14.4 kbaud
Fax	2400 baud ... 14.4 kbaud
GPRS	300 bps ... 85.6 kbps
Compatibility	V.34, V.32, V.22bis, V.110
GPRS compatibility	GPRS Class 10, Class B Encoding scheme: CS1 ... CS4 4 time slots for receiving data 2 time slots for transmitting data
Command set compatibility	AT standard command set and extended V.250 basic command set
Antenna connection	50 Ω impedance SMA female antenna connector
Bandwidth	70 MHz (850 MHz), 80 MHz (900 MHz) 170 MHz in DCS and 140 MHz (PCS band)
VSWR values	≤ 2:1

Conformance with EMC directive 89/336/EEC

Noise immunity test according to EN 61000-6-2

Electrostatic discharge (ESD)	EN 61000-4-2/ IEC 61000-4-2	Criterion B 6 kV contact discharge 8 kV air discharge
Electromagnetic fields	EN 61000-4-3 IEC 61000-4-3	Criterion A Field strength: 10 V/m
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	Criterion B Supply lines: 2 kV Signal/data lines: 2 kV
Surge test	EN 61000-4-5 IEC 61000-4-5	Criterion B Signal/data lines: 1 kV Supply lines: 0.5 kV
Conducted interference	EN 61000-4-6 IEC 61000-4-6	Criterion A Test voltage 10 V

Noise emission test according to EN 61000-6-4

Noise emission of housing	EN 55011	Class A

Conformance with R&TTE directive 1999/5/EC

EMC Noise immunity (electromagnetic compatibility)	EN 61000-6-2	Generic standard for the industrial sector
Security Protection of personnel with regard to electrical safety	EN 60950	
Health Limitation of exposure of the population to electromagnetic fields	EC Gazette 1999/519/EC	EC Council recommendation of July 12, 1999
Radio Effective use of the frequency spectrum and prevention of radio interference	DIN EN 301511	

Approvals

For the latest approvals, please visit www.download.phoenixcontact.com.

5.2 Ordering data

5.2.1 Products

Description	Type	Order No.	Pcs./Pkt.
Inline Controller; complete with accessories (connectors and labeling fields)	ILC 150 GSM/GPRS	2916545	1

5.2.2 Accessories

Description		Type	Order No.	Pcs./Pkt.
Inline connector set for Inline bus coupler with connected I/Os		IL BKDIO-PLSET	2878599	1
GSM dual band antenna with omnidirectional characteristics Antenna cable with SMA connector Degree of protection Dimensions	 2 m IP65 76 mm x 20 mm	PSI-GSM-900/1800-ANT	2708902	1
QUINT POWER power supplies		See latest Phoenix Contact INTERFACE catalog		

5.2.3 Software

Description	Type	Order No.	Pcs./Pkt.
PC WorX automation software	See latest Phoenix Contact AUTOMATIONWORX catalog		
Configuration and diagnostic software for Ethernet networks in the automation environment (Factory Manager)	FL SWT	2831044	1

5.2.4 Documentation

Description	Type	Order No.	Pcs./Pkt.
"Configuring and installing the INTERBUS Inline product range" user manual	IB IL SYS PRO UM E	2743048	1
"Automation terminals of the Inline product range" user manual	IL SYS INST UM E	2698737	1
PC WorX Quick Start Guide	UM QS EN PC WORX	2699862	1
Data sheet for the PSI-GSM-900/1800-ANT GSM dual band antenna	DB EN PSI-GSM-900/1800-ANT	–	1

A Appendix: Service and maintenance

A 1 Error causes and remedies

Table A-1 Installation error causes and remedies

Error	Cause	Remedy
No outputs can be set.	– The voltage supply U_S is not present (see diagnostic LED).	– Connect the voltage supply.
The devices connected to the Inline Controller cannot be read.	– The voltage supply U_S is not present (see diagnostic LED).	– Connect the voltage supply.
The IEC 61131 program is not running.	– Mode selector switch in STP position.	– Set mode selector switch to RUN/PROG position.
The serial interface is not operating.	– The connector pin assignment of the programming cable or of the connector adapter used is incorrect.	– Use the PRG CAB MINI DIN programming cable (Order. No. 2730611) for the Inline Controller,
The devices on the remote bus cannot be started up.	– The IBS IL 24 RB-T (-PAC) Inline terminal is not installed directly after the Inline Controller.	– Insert the terminal as the first Inline terminal directly next to the Inline Controller.
The diagnostic LED of a device is flashing quickly.	– The device has not been assembled correctly.	– Check the connection to the previous module (bus contacts).

For additional information about errors, their causes and remedies, please refer to the online help for the PC WorX function blocks described in Section 3, "The Inline Controller under PC WorX".

A 2 Updating the Inline Controller firmware

The firmware (integrated software on the Inline Controller) can be updated using the Ethernet interface. Such firmware updates are exclusively used for adding new functions that are implemented within the scope of continuous product improvement. No firmware update is required for normal system operation.

To update the firmware, please proceed according to the "Firmware update ≥ 4.6F/1.13" application note. This can be downloaded from www.download.phoenixcontact.com.

A 3 Connecting unshielded cables

Unshielded cables are used to connect the I/O devices and the supply voltage to the Inline Controller.

Connect these cables to the relevant Inline connectors using the spring-cage connection method. You may connect cables with a connection cross-section of 0.2 mm^2 to 1.5 mm^2 (24 - 16 AWG).

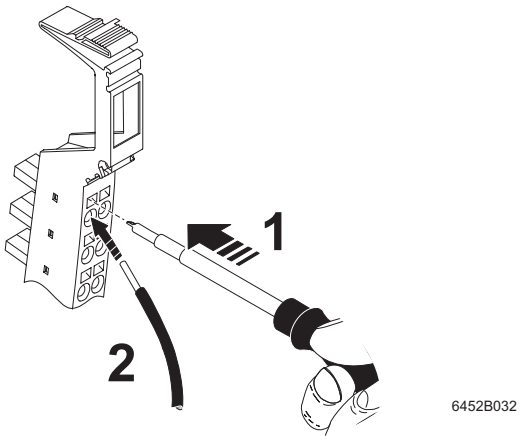


Figure A-1 Connecting unshielded cables

Wire the connectors according to your application.

When wiring, proceed as follows:

- Strip 8 mm off the cable.

Inline wiring is normally done without ferrules. However, it is possible to use ferrules. If using ferrules, make sure they are properly crimped.

- Push a screwdriver into the slot of the appropriate terminal point (Figure A-1, detail 1), so that you can insert the wire into the spring opening.
  Phoenix Contact recommends using an SFZ 1-0,6x3,5 screwdriver (Order No. 1204517).
- Insert the wire (Figure A-1, detail 2). Remove the screwdriver from the opening. This clamps the wire.

After installation, the wires and the terminal points should be labeled.

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